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What is claimed is:

1. A magnet type stepping motor comprising:

(1) a stator having three-phase stator windings, and 6m pieces of stator main pole arranged side by side, where m is an integer and ≥ 1, the stator windings of one phase being wound around every two stator main poles among the 6m pieces of the stator main pole, wherein when the stator windings of one phase are excited with a direct current, m pieces of N pole and m pieces of S pole are formed alternately on the 6m pieces of stator main pole, and

(2) a rotor of a cylindrical permanent magnet magnetized in the circumferential direction so as to form Z/2 pieces of N pole and Z/2 pieces of S pole alternately, where Z is the number of rotor poles.

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2. The permanent magnet type stepping motor as claimed in claim 1, wherein the number of rotor poles is set to m· (12n± 2) preferably, where n is an integer and ≥ 1.

3. The permanent magnet type stepping motor as claimed in claim 1, wherein the number of rotor poles is set to m· (12n± 2) preferably, and a plurality of pole teeth are

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formed on each of the stator main poles, where n is an integer and ≧ 2.

4. A permanent magnet type stepping motor comprising (1) a stator having two-phase stator windings, and 12 pieces of stator main pole arranged side by side, the stator windings of one phase being wound around every one stator main poles among the 12 pieces of the stator main pole, wherein when the stator windings of one phase are excited with a direct current, 3 pieces of N pole and 3 pieces of S pole are formed alternately on the 12 pieces of stator main pole, and

(2) a rotor of a cylindrical permanent magnet magnetized in the circumferential direction so as to form Z/2 pieces of N pole and Z/2 pieces S pole alternately, where Z is the number of rotor poles.

5. The permanent magnet type stepping motor as claimed in claim 4, wherein the number of rotor poles is set to 24n± 6, where n is an integer and ≧ 1.

6. The permanent magnet type ste ping motor as claimed in claim 4, wherein the number of rotor poles is set to 24n± 6, and a plurality

of pole teeth are formed on each of the stator main poles, where n is an integer and ≧ 2.

7. A hybrid type stepping motor comprising

(1) a stator having two-phase stator windings, and 12 pieces of stator main pole arranged side by side, the stator windings of one phase being wound around every one stator main poles among the 12 pieces of the stator main pole, wherein when the stator windings of one phase are excited with a direct current, 3 pieces of N pole and 3 pieces of S pole are formed alternately on the 12 pieces of stator main pole, and

(2) a hybrid type rotor consisting of two rotor elements of magnetic material each formed on the circumference thereof with a plurality of pole teeth and of a permanent magnet magnetized in the axial direction held between said two rotor elements.

8. The hybrid type stepping motor as claimed in claim 7, wherein the number of rotor pole teeth is 12n ± 3, where n is an integer and ≧ 1.

9. The hybrid type stepping motor as claimed in claim 7, wherein the number of rotor

pole teeth is 12n ± 3, and a plurality of pole teeth are formed on each of the stator main poles, where n is an integer and ≥ 2.

10. A hybrid inner rotor type stepping motor comprising

(1) a stator having three-phase stator windings of U, V, and W, and 12 pieces of stator main pole arranged side by side and extending rarially form an annular stator york, k pieces of pole tooth being formed on the tip end of each stator main pole, where k is an integer and ≥ 2, the stator windings of one phase being wound around every two stator main poles among the 12 pieces of the stator main pole, wherein when the stator windings of one phase are excited with a direct current, 2 pieces of N pole and 2 pieces of S pole are formed on the 4 pieces of stator main pole, and

(2) a hybrid type inner rotor consisting of two magnetic rotor elements each having a plurality of pole teeth on the outer peripheral surface thereof and a permanent magnet magnetized in the axial direction and held by the two magnetic rotor elements therebetween, the one magnetic rotor element being deviated

from the other in the peripheral direction by 1/2 pitch of the pole teeth, wherein the number of the pole tooth is 12 k ± 2.

11. A hybrid outer rotor type stepping motor comprising

(1) a stator having three-phase stator windings of U, V, and W, and 12 pieces of stator main pole arranged side by side and extending radially form an annular stator york, k pieces of pole tooth being formed on the tip end of each stator main pole, where k is an integer and ≧ 2, the stator windings of one phase being wound around every two stator main poles among the 12 pieces of the stator main pole, wherein when the stator windings of one phase are excited with a direct current, 2 pieces of N pole and 2 pieces of S pole are formed on the 4 pieces of stator main pole, and

(2) a hybrid type outer rotor consisting of two magnetic rotor elements each having a plurality of pole teeth on the inner peripheral surface thereof and a permanent magnet magnetized in the axial direction and held by the two magnetic rotor elements therebetween, the one magnetic rotor element being deviated

from the other in the peripheral direction by 1/2 pitch of the pole teeth, wherein the number of the pole tooth is 12 k ± 2.

12. The stepping motor as claimed in claim 10 wherein the pitch of stator magnetic pole teeth is not larger than the pitch of rotor pole teeth.

13. A hybrid type three-phase stepping motor comprising

(1) a stator having three-phase stator windings of U, V, and W, and 12 pieces of stator main pole arranged side by side and extending radially form an annular stator york, k pieces of pole tooth being formed on the tip end of each stator main pole, where k is an integer and ≥ 2, the stator windings of one phase being wound around every two stator main poles among the 12 pieces of the stator main pole, wherein when the stator windings of one phase are excited with a direct current, 2 pieces of N pole and 2 pieces of S pole are formed on the 4 pieces of stator main pole, and

(2) a hybrid type rotor consisting of two magnetic rotor elements each having a plurality of pole teeth on the peripheral surface thereof

and a permanent magnet magnetized in the axial direction and held by the two magnetic rotor elements therebetween, the one magnetic rotor element being deviated from the other in the peripheral direction by 1/2 pitch of the pole teeth, wherein in case that the windings of star or delta connection are excited, the wiring direction or the winding direction of the windings of one phase is reversed to that of the remaining phases.

14. An outer rotor type stepping motor comprising

a rotor having pole teeth of 12n $\pm$ 2 on the inner peripheral surface thereof, where n is an integer and $\geq$ 1,

a stator having three-phase stator windings of U, V and W, and 12 pieces of stator main pole arranged side by side and extending radially outwardly from an annular stator york, a plurality of pole teeth being formed on the tip end of each stator main pole, and a permanent magnet magnetized in the axial direction thereof and held between splitted stator elements, the stator windings of one phase being wound around every two stator main

poles among the 12 pieces of the stator main pole, each of the windings being wound extending over the two splitted stator elements, wherein when the stator windings of one phase are excited with a direct current, 2 pieces of N pole and 2 pieces of S pole are formed on the 4 pieces of stator main pole.

15. The stepping motor as claimed in claim 14 wherein when the windings ~~of star~~ or delta connection are excited, the winding ends of the windings of U, V and W phases are connected together and the winding direction of the windings of one phase is reversed to that of the remaining phases.

16. The outer rotor type stepping motor as claimed in claim 14, wherein both sides of the rotor are supported by two brackets, respectively, so as to form a gap between the inner peripheral surface of the rotor and the outer peripheral surface of the stator.

17. A driving method of a three-phase annular winding cascade claw-pole type stepping motor

comprising (1) a rotor consisting of a cylindrical magnet magnetized in the circumferential direction so as to form M pieces of N pole and M pieces S pole alternately, where M is an integer and ≧ 2, and (2) a stator having annular three stator units arranged in the axial direction of the rotor concentrically with the rotor axis, each of said stator unit consisting of two opposite stator cores having craw poles extending axially on the inner peripheral surface thereof, and of one of three stator windings of U, V and W phases held between said two stator cores, said windings of U, V and W phases being arranged in this order in the axial direction, said craw poles being separated by 180° /M from one another and magnetized by said stator winding in opposite polarities alternately, said three stator windings being connected to form a star or delta connection, adjacent craw poles magnetized by the stator windings of U phase and V phase are deviated by 60° /M from each other in the circumferential direction, and adjacent craw poles magnetized by the stator windings of V phase and W phase are deviated by 60° /M from

each other in the circumferential direction, said annular stator windings being excited so that a magnetic flux generated by the annular stator windings of one phase in the axial direction becomes always opposite to that by annular stator windings of the other phase, in case of two phase exciting driving.

18. A driving method of a three-phase annular winding cascade craw-pole type stepping motor comprising

a rotor consisting of a cylindrical magnet magnetized in the circumferential direction so as to form M pieces of N pole and M pieces S pole alternately, where M is an integer and ≥ 2, and

a stator having annular three stator units arranged in the axial direction of the rotor concentrically with the rotor axis each of said stator unit consisting of two opposite stator cores having craw poles extending axially on the inner peripheral surface thereof, and of one of three stator windings of U, V and W phases held between said two stator cores, said windings of U, V and W phases being arranged in this order in the axial direction, said craw

poles being separated by 180° /M from one another and magnetized by said stator winding in opposite polarities alternately, said three stator windings being connected to form the star or delta connection, adjacent craw poles magnetized by the stator windings of U phase and V phase are deviated by 120° /M from each other in the circumferential direction, and adjacent craw poles magnetized by the stator windings of V phase and W phase are deviated by 120° /M from each other in the circumferential direction, wherein the magnetic flux generated by annular stator windings of one phase in the axial direction becomes always the same to that generated by the other annular stator windings of the other phase adjacent to said annular stator windings of said one phase, but a magnetic flux generated by the annular stator windings of one phase in the axial direction becomes always opposite to that generated by the annular stator windings of the other phase which is not adjacent to said annular stator windings of said one phase, in case of two phase exciting driving.

19. A driving method of a three-phase

annular winding cascade craw-pole type stepping motor comprising

a rotor consisting of a cylindrical magnet magnetized in the circumferential direction so as to form M pieces of N pole and M pieces S pole alternately, where M is an integer and ≧ 2, and a stator having annular three stator units arranged in the axial direction of the rotor concentrically with the rotor axis each of said stator unit consisting of two opposite stator cores having craw poles extending axially on the inner peripheral surface thereof, and of one of three stator windings of U, V and W phases held between said two stator cores, said windings of U, V and W phases being arranged in this order in the axial direction, said craw poles being separated by 180° /M from one another and magnetized by said stator winding in opposite polarities alternately, said three stator windings being connected to form the star or delta connection, adjacent craw poles magnetized by the stator windings of U phase and V phase are deviated by 120° /M from each other in the circumferential direction, and

~~adjacent craw poles magnetized by the stator windings of V phase and W phase are deviated by 120° /M from each other in the circumferential direction, each of said annular stator windings having a center tap, said annular stator windings being excited by a unipolar circuit having six transistors so that a magnetic flux generated by the excited annular stator windings of one phase in the axial direction becomes always opposite to that generated by the excited annular stator windings of other phase, in case of two phase exciting driving.~~

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